Reviewer Review Report Format

Technical Publication: Incorporation of Climatic Indicators in SFWMD Planning and Operations
Document size (pages): Thirty five (35) pages plus Appendix A & B.
_____ Due date:___30 June 2006 _____

Reviewer section
Reviewer's name____John A. Dracup_____
Total pages reviewed: _Thirty-five pages plus Appendix A & B (note: the PDF file lists 58 pages) plus other references as noted.

_____ Total review time:_Approx 30 hours_____

1. Has the District adequately addressed the long-term wet and dry cycles in modeling for a) facility planning, and b) operational planning. If not, what standard engineering practices can the District modelers follow to address climate variability due to indicators such as AMO.

   It is my opinion that the District has not adequately addressed the long-term wet and dry cycles (Note: I object to the use of the term cycle, which implies a regular periodicity. The term wet or dry period is more appropriate) for either facility or operational planning. What the District has done is to study the influences of individual climatic indices such as ENSO, PDO and the AMO on their water resource system. However, there has not been an effort by the District to look at a host of other climatic indices that may have an influence on their water resource system. These are presented on the NOAA web site: http://www.cdc.noaa.gov/ClimateIndices/List/

   Furthermore, the District has not included research efforts by Hidalgo:

   Hidalgo, H. G. 2004. Climate precursors of multidecadal drought variability in the western United States. *Water Resour. Res.*, Vol. 40, No. 12, W12504 10.1029/2004WR003350

   And similar research by McCabe & Palaecki:

   McCabe, G.J., and Palaecki, M.A., 2006, Multidecadal climate variability of global lands and oceans: *International Journal of Climatology*, v. 26, no. 7, p. 849-865.

   These authors have looked at the combination of various climate indices, that is when both the PDO and the AMO are occurring simultaneously.

2. Is there compelling evidence that the volume of inflows to Lake Okeechobee will be as much as double during a wetter cycle as they were in the dry cycle?

   No, there is no compelling evidence to support this hypothesis. In Appendix A, Figure 1 (page A-4 and A-5), there is no box plot of rainfall at any of the stations that indicates a

doubling of rainfall during the wetter cycles than the drier cycles. (Again, I don't like the use of the word "cycles" in this report as it implies a regular pattern of occurrences. I suggest the use of the word wetter and drier periods).

The box in Figure 5, page 12, (Note: I use the page numbers for the printed version, not the PDF version) states ""Lowest year used…was 2000….during the current web climate cycle" This "wet cycle" is AMO4, 1995 to 2005, however, the 11 years in this cycle are distributed throughout this figure, from a low during 2000 to a high during 1997. This again indicates that there is a doubling of inflow during a "wet cycle".

Finally, looking at Figures 6, 7, and 8, pages 14-15, there is no evidence there that there is a doubling of inflows during the wetter "cycles".

2. (con't) In the current modeling efforts, has the District adequately addressed the variability of inflows into Lake Okeechobee?

   Yes, I believe so. The inflow data speaks for itself. What is important here is how these data are presented in various formats. I think it would be helpful if both the rainfall and the inflow data were presented as anomalies from their means. Also, I have found that plotting the data as cumulative departures from the mean is very useful when one is looking for dry and wet periods.

3. Does the modeling approach used by the District for both CERP and WSE schedule design meet requirements of standard engineering and design practices? If not, what additional steps should the District take to improve modeling for these applied purposes?

   I was a member of the SFWMD peer review panel for the South Florida Water Management Model (SFWMM). I was very impressed with SFWMM and its development indicates that the SFWMD modeling team is on the forefront in the development of water management models.

   In this report, the SFWMM is discussed under the Modeling section on page 17 (this is obviously a cut and paste section as this author mentions the term "climate change" in the paragraph starting "The selection of an appropriate period ….." on page 17. This report is about climate variability, not climate change). However, I could not find anything on pages 17 – 19 where the modeling of either CERP or WSE is discussed. However, in the Ex Summary, page A-iii, last paragraph, it states "This model (referring to SFWMM) was also used for analysis of future projects proposed for CERP….." however, I could not find anything else about this in the text. Note that what CERP represents is not presented in the Ex Summary, it is first introduced on page 1.

   On page 2, second paragraph, last sentence it is stated "To develop the CERP, the district used the SFWMM with …" However, there are no details on how CERP was used to "develop the CERP".

WSE is first discussed on page 24 to 26. It appears that the "modeling" proposed for the WSE is the "Multi-objective Tradeoff analysis…" that is presented in Figure 12, page 25. Looking at Figure 12, it is not clear to me how the change, or "Trade-Off" in one objective impacts the other objectives. In the first paragraph, second sentence, of page 25, it is stated "This improvement was estimated for the climatological regime….". However, nothing is said about how the estimates are being made.

Therefore, I cannot find enough information in this report to answer the first part of question #3. However, being familiar with the SFWMM model, I believe that it would be adequate to model the designs for both CERP and WSE, however, it is my opinion that the approach to be used by the SFWMD is not adequately discussed in this report.

4. Are the steps being taken in the adaptive management/modeling approach used by the District adequate to address the uncertainties in climate predictions and to assimilate new information?

   I find it difficult to answer this question as the Districts use of Adaptive management is only presented in a brief, five sentence, paragraph on page 28 of this report. The only mention of climate in the paragraph is the last sentence which states "Climate indicators, trends, and global warming issues will play a key role in these overall system reviews." (Again this seems to be a "cut and paste" paragraph from another report as the term "global warming" is used here, which is not the objective of this report.)

   There are no references in this section on Adaptive management. There are numerous journal articles and books on this subject. My favorite article is:

   Ladson, A.R. and Argent R. M. (2002) Adaptive management of environmental flows: lessons for the Murray-Darling Basin for three large north American Rivers. *Australian Journal of Water Resources* 5(1):89-101.

5. Except for basic research approaches, are there other facility planning options that the District should consider to address the possibility of a continued wetter cycle?

   Again, I object to the use of the term "cycle". I believe that "wetter period" is more appropriate. Although the word "facilities" is used throughout this report, it is invariably used in a very vague form. However, on page 28, there is the statement that "the additional cost of $200,000,000 to enlarge regional storage facilities….". However, nothing is said on what facilities would be enlarged and what would be the results of this enlargement. Also, in the fourth recommendation, page 30, there is a mention of "size of facilities design (sic) by CERP". This again is a very vague statement.

   Therefore, it is difficult to answer a question concerning "other facility planning options" when it is not clear what are the current options.

6. Are the data and models used by the District appropriate (reasonable and adequate) for their intended applications?"

   Concerning data: on page 18, the paragraph beginning with "The SFWMM originally used an input data set……" it is stated that the 1969-82 data set was chosen because it represented the most accurate and complete combination of hydrologic….. ". Later the model data sets were increased to allow simulation for rainfall years 1965-1990." It is surprising to me that accurate data earlier than 1965 is not available, especially rainfall data.

   However, due to the short available time series of rainfall data, the District might consider looking into proxy data from paleoclimate records.

   Concerning models: I believe that the SFWMM model is appropriate for the analysis of the Districts planning and design options.

   Please list any issues/concerns which you feel MUST be addressed before this document can be published. Please list areas of the publication that were NOT covered by your review (e.g., References, meeting journal format requirements, adherence to District standards...)

   I believe that my review covered all of the areas that were requested by the District. I have read the publication through several times and I believe that I covered all the areas of concern.

   Please list any typos or minor format issues that must be corrected.

   The objectives of the report need to be clearly stated in the Ex Summary.

   This publication has numerous typos and inconsistencies, some of which I have covered above. The first typo is on the fifth line of the Ex Summary, not an auspicious start, that is it should by "Decadal" and not "Decibel". Now this might seem to be a minor and an obvious typo, but I suspect that the author did a spell check and "Decibel" came up and he hit replace. However, this typo, and the many others (is it south Florida or South Florida?) is indicative of a sloppy report, I think that the SFWMD can do better than this.

   In the Ex Summary it is stated that predictions are needed but there is no statement of how far in the future they are desired or on what increment of time are they needed, monthly, annual?

   In the first paragraph of page A-iv, it states "Changes in these features due to climate…" What features are they referring to?

   In the Ex Summary the acronym CERP is used without explaining what it represents. It is explained on page 1 of the report.

Although this is a report on climate variability, the term global warming pops up every once in a while. However, there is never any follow up in the report on global warming. For example, see page 2, last paragraph and page 3, first paragraph.

On page 4, paragraph starting with "Based on these considerations, a series of key questions concerning climate change and ……" But most of the "key questions" (except number five) and this report has to do with climate variability not climate change. The authors are either not aware of the difference between climate variability and climate change, which is hard to believe, or this is just another example of sloppy writing.

On page 6, "ENSO events typically have a 3-7 year cycle…". ENSO events do not cycle, the occur at various periods.

In Figure 3, page 8, it would be much more meaningful to present the data as anomalies from the mean value.

Figure 4 needs a reference.

On page 11, Artificial Neural Networks are discussed but no results are presented.

The units of the mass balance equation presented on page 12 are not consistent. It must be assumed here that the surface area (acres) do not change with the rainfall or inflow. This equation needs to be explained in more detail.

Page 13, second paragraph, "….was the highest at about 48%…of what?

Figures 6, 7 and 8 all are stated as depicting rainfall vs. runoff, but all have different captions and different labels on the Y-axis.

Page 17, second paragraph, again the use of "climate change".

Figure 10, page 20. It seems to me that the time series of wet and dry years for the entire 111 year record, see page 19, should be tested to see if they are statistically different.

Page 21, again the use of "climate change"

I found the entire section on Project Design, page 22 to 24, to be very vague. More details should be given on the Conditional Position Analysis and the Unconditional Position Analysis. An example would be helpful.

Page 24, the relationship between the USACE and the District should be explained.

Page 25, as I stated earlier, Figure 12 needs further explanation. How is changing one objective in the "Multi-Objective Trade-Off Analysis" cause a change in another objective?

Page 27, last paragraph. Here the author is discussing Figure 6, which is on page 14. On page 13, it is stated that the data for Figure 6 are for AMO2, AMO3 and AMO4. These represent a data set from 1926 to 2005. However, on page 27, the author states that Figure 6 uses data "for the period from 1913 to 2005". Another example of a sloppy report.

Page 31, VII References: There are numerous mistakes in the formatting of the references. I suggest that the District follow the reference guidelines of the AGU: http://www.agu.org/pubs/AuthorRefSheet.pdf
Or purchase reference software such as End Notes and use it on all of their publications.

I noted that P.J. Trimble is referenced eight times. I'm sure that these are all valuable contributions to the literature, however, none of the eight references are in peer reviewed scholarly journals. I suggest that the he submit these workshop papers to journals so that they move out of the arena of the gray literature and to a form that is readily accessible.

Finally, I have asked my colleague Bruce Rhodes of Melbourne Water (Victoria, Australia) to mail to J.T.B. Oberysekera their report "Hydroclimatic Variability and Melbourne's Water Resources". This document should be helpful to the District in their further efforts to use climate variability for long term water resource planning and design.

I have read this technical publication and have provided a careful, objective professional review.

Signature ___JOHN A. DRACUP_____

Date___July 7, 2006_____
Reviewer: Return your completed Review Report to the Project Manager and to the Editor.